REMARKS/ARGUMENTS

Claims 1-14 are pending in this Application. This Amendment Amends Claims 1, 11, 12 and 14; Adds new Claim 15 and Cancels Claims 2 and 3. Claims 5 and 6 have been Rejected under 35 U.S.C. §112, second paragraph, as being indefinite; Claims 1-4, 7, 8, 13 and 14 have been Rejected under 35 U.S.C. 102(b) as being anticipated by Shoji *et al.* (US 5,626,985); Claims 1-7 and 12-14 have been Rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kelley *et al.* (US 6,322,744); Claims 1-7 and 12-14 have been Rejected under 35 U.S.C. 102(a) and (e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tsushima *et al.* (US 6,558,846); Claims 4 and 8 have been Rejected under 35 U.S.C. 103(a) as being unpatentable over either Kelley *et al.* or Tsushima *et al.* each in view of Tomiyama *et al.* (US 6,053,953). Claims 9-11 have been Objected to as being Dependent upon a Rejected Base Claim, but the Examiner has indicated that they would be allowable if rewritten in Independent Form including all of the limitations of the Base Claim and any Intervening Claims.

Rejection of Claims under 35 U.S.C. § 112, second paragraph:

Specifically

The Examiner states that:

> Claims 5 and 6 are rejected under 35 U.S.C.112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term "high surface area" in claims 5 and 6 is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Response

Applicant Respectfully disagrees with the Examiner. As relates to a "high surface area carbon" this is a term that is well understood by a person of ordinary skill in the art. Applicant respectfully draws the Examiner's attention to the following 79 U.S. patents in which the term high surface area carbon is used in the Claims: 1. 6,920,873, Portable heating pack; 2. 6,890,680, Modified diffusion layer for use in a fuel cell system; 3. 6,770,394, Fuel cell with monolithic flow field-bipolar plate assembly and method for making and cooling a fuel cell stack; 4. 6,704,192, Electrically conductive, freestanding microporous sheet for use in an ultracapacitor; 5. 6,649,299, Gas diffusion electrode with nanosized pores and method for making same; 6. 6,576,365, Ultra-thin electrochemical energy storage devices; 7. 6,551,569, Supported tungsten carbide material; 8. 6,503,652, Fuel cell assembly method with selective catalyst loading; 9. 6,428,931, Methods for making oxygen reduction catalyst using micelle encapsulation and metal-air electrode including said catalyst;

10. 6,403,255, Polyvinyl mercaptan redox material for cathodes in non-aqueous batteries; 11. H001,983, Thermal battery and method of making the same having solid complex of SO2 and lithium tetrachloroaluminate as electrolyte; 12. 6,099,960, High surface area nanofibers, methods of making, methods of using and products containing same; 13. 6,025,020, Preparation of high energy capacity ruthenium oxide; 14. 6,024,848; Electrochemical cell with a porous support plate; 15. 6,017,650, Gas-diffussion electrodes for polymeric membrane fuel cell; 16. 5,916,702, CO tolerant platinum-zinc fuel cell electrode; 17. 5,841,627, Pseudo-capacitor device for aqueous electrolytes; 18. 5,744,258, High power, high energy, hybrid electrode and electrical energy storage device made therefrom; 19. 5,643,437, Co-generation of ammonium persulfate anodically and alkaline hydrogen peroxide cathodically with cathode products ratio control; 20. 5,630,974, Preparation of selective infrared line emitter composites; 21.5,591,538, Zinc-bromine battery with non-flowing electrolyte; 22. 5,585,999, Supercapacitor electrochemical cell; 23. H001,545, Oxyhalide electrochemical cell including an alkali metal intercalated carbon as the anode; 24. 5,523,177, Membrane-electrode assembly for a direct methanol fuel cell; 25. 5,521,020, Method for catalyzing a gas diffusion electrode; 26. 5,494,763, Electrochemical cell; 27. 5,482,536, Apparatus for containment and scrubbing of toxic gas from a leakage location and method therefore; 28. 5,358,803, Catalyzed cathodes for electrochemical cells; 29. 5,318,862, Bifunctional gas diffusion electrodes employing wettable, non-wettable layered structure using the mud-caking concept; 30. 5,316,990, Catalyst material; 31. 5,284,571, Method of making electrodes for electrochemical cells and electrodes made thereby; 32. 5,086,374, Aprotic electrolyte capacitors and methods of making the same; 33. 5,085,760, Electrochemical gas sensors, 34. 5,002,741, Method for SO.sub.X /NO.sub.X pollution control; 35. 4,999,330, High-density adsorbent and method of producing same; 36. 4,946,663, Production of high surface area carbon fibres; 37. 4,914,071, Method for preparing a catalyst; 38. 4,902,588, Electrolyte additives to improve voltage regulation in the lithium-copper chloride rechargeable cell; 39. RE33,149, Finely particulated colloidal platinum compound and sol for producing the same and method of preparation of fuel cell electrodes and the like employing the same; 40. 4,855,276, Solid filtration medium incorporating alumina and carbon; 41. 4,844,993, Additive to improve voltage regulation in a lithium-copper chloride rechargeable cell; 42. 4,731,464, Process for the synthesis of an alkyl nitrile from an alkanol; 43. 4,729,885, High mixing reactor process; 44. 4,683,516, Extended life capacitor and method; 45. 4,659,559, Gas fueled fuel cell; 46. 4,622,611, Double layer capacitors; 47. 4,619,874, Electrochemical cells with end-of-life indicator; 48. 4,605,989, Electrodes for double layer capacitors; 49. 4,543,305, Method of pretreating carbon black powder to improve cathode performance and lithium sulfuryl chloride cell including the pretreated carbon black powder; 50. 4,536,358, Process for the production of high surface area catalyst supports; 51. 4,526,881, Method of pretreating carbon black powder to improve cathode performance and lithium sulfuryl chloride cell including the pretreated carbon black powder; 52. 4,497,883, Battery having cathode of sheet loaded with graphite and carbon sheet anode; 53. 4,474,863, High energy ambient temperature inorganic electrochemical power cell; 54. 4,471,014, Ordered bed packing module; 55. 4,440,617, Non-bleeding electrode; 56.

4,410,609, Electrochemical cell; 57. 4,400,453, Non-aqueous electrochemical cell; 58. 4,374,907, Gaseous hydrogen and oxygen combining and condensing device; 59. 4,370,284, Non-bleeding electrode; 60. 4,368,115, Catalysts comprising layered chalcogenides of group IVb-group VIIb prepared by a low temperature nonaqueous precipitate technique; 61. 4,367,268, High energy electrochemical power cell; 62. 4,359,406, Highly dispersed supported group VIII metal-phosphorus compounds, and highly dispersed, supported group VIII metal-arsenic and a process for making said compounds; 63. 4,359,404, Hydrogenation of esters using alkali doped heterogeneous Group VIII transition metal catalysts; 64. 4,346,240, Hydrogenation of esters using alkali doped heterogeneous group VIII transition metal catalysts; 65. 4,308,171, Method of preparing di and poly chalcogenides of group VIIb by low temperature precipitation from nonaqueous solution and small crystallite size stoichiometric layered dichalcogenides of rhenium and technetium; 66. 4,299,892, Amorphous and sheet dichalcogenides of Group IVb, Vb, molybdenum and tungsten; 67. 4,293,396, Thin carbon-cloth-based electrocatalytic gas diffusion electrodes, and electrochemical cells comprising the same; 68. 4,279,871, Process for treating chlorinated titaniferous material to remove vanadium; 69. 4,279,737, Hydrodesulfurization over catalysts comprising chalcogenides of group VIII prepared by low temperature precipitation from nonaqueous solution; 70. 4,248,682, Carbon-cloth-based electrocatalytic gas diffusion electrodes, assembly and electrochemical cells comprising the same; 71. 4,228,034, Catalytically active mass for the exchange of hydrogen isotopes between streams of gaseous hydrogen and liquid water; 72. 4,221,748, Method for making porous, crushable core having a porous integral outer barrier layer having a density gradient therein; 73. 4,191,721, Making ceramic articles having a high degree of porosity and crushability characteristics; 74. 4,191,720, Method for making porous, crushable core having an integral outer barrier layer; 75. 4,143,123, Process for the exchange of hydrogen isotopes between streams of gaseous hydrogen and liquid water; 76. 4,113,924, Zinc-halogen compound electrochemical cell having an auxiliary electrode and method; 77. 4,055,628, Method for preparing graphite containing carbon; 78. 4,044,193, Finely particulated colloidal platinum compound and sol for producing the same, and method of preparation of fuel cell electrodes and the like employing the same; 79. 4,008,174, Process for regenerating a solid copper-chromium reactant used in the removal of hydrogen sulfide from hydrogen recycle gas.

While it is true that there may be a further explanation in the Specification of some of these Patents, it is by no means true of all. For example, in the patent listed as Number 3 above United States Patent 4,044,193 Petrow, *et al.* August 23, 1977, Claim 3 reads as follows:

> 3. In a fuel cell and the like, a catalytic electrode comprising an electrically-conducting ***high surface area carbon*** substrate on which has been deposited substantially uniformly platinum particles having a particle size substantially in the range of 15 to 25 Angstroms and being formed from the oxidative decomposition of a platinum complex comprising an oxidizable ligand. (emphasis added)

While the Specification reads:

> Whereas in the earlier-described methods, the platinum colloidal sol is first formed and then applied to the carbon particle substrate, if the reaction described immediately above is performed in the presence of the high surface area carbon, the carbon particles act both as nuclei and as a support for the extremely small particles of the platinum compound, as they are formed, and they are deposited on the carbon rather than coalescing to yield a lower surface area precipitate. It has been found that this carbon nucleation of the platinum particles permits the restriction of the platinum deposits to particulate catalytic particles of the said preferred 15-25 Angstrom size range.
>
> And:
>
> Several examples of the use of the reactions observed above are given below. Basically, however, they all depend upon the oxidation of the sulfite present in a platinum-sulfite complex, with H.sub.2 O.sub.2 being the preferred oxidant, although other non-complexing oxidants, such as potassium permanganate, persulfuric acid and the like have been used. The term "non-complexing oxidant", as used in this specification and in appended claims, means an oxidant which does not introduce groups capable of forming strong complexing ligands with platinum. Also while **any high surface area carbon** is suitable, the carbon black, Vulcan XC-72 (Cabot Corp.), has been found to yield an excellent catalyst; but the fact that this carbon is used in the examples to be cited does not imply that other carbons cannot be used. Nor, since the carbon is merely a support onto which to deposit the colloidal particles of platinum as they are formed, should it be thought that carbon is the only support upon which the deposit can be made. Other materials such as Al.sub.2 O.sub.3, BaSO.sub.4, SiO.sub.2, etc. can be used as supports for a high surface area platinum, as previously described, but are, of course, useful for other catalytic properties rather than for fuel cells, electrodes and the like, because of their high electrical resistance. We shall now proceed to a further series of examples. (emphasis added)

Applicant calls the Examiner's attention to applicant's own use of the term "high surface area carbon" at paragraph [0008], line 5; paragraph [0015], lines 3-4 and 6-7; paragraph [0008], lines 7-3, the last of which reads as follows:

> There are a number of commercially available high surface carbon materials such as carbon black or acetylene black that may be employed in the practice of the present invention. Some specifically preferred commercial materials include products sold under the name Super P carbon black manufactured by MMM Carbon, Belgium; Shawinigan Black acetylene black manufactured by

> Chevron Phillips Chemical Company (SAB), and a product referred to as Black Pearls 2000 manufactured by the Cabot corporation.

Applicant believes that it has used the term "high surface area carbon" consistent with the understanding of a person of ordinary skill in the art and, moreover, through the use of specific examples in the Specification has fully made this term enabling so that the requisite degree of "highness" would be readily ascertained by any person of ordinary skill in the art. The use is fully consistent with the use of the term in at least 79 Issued Patents, which should indicate that the term is not indefinite as used when referring to "high surface area carbon."

Rejection of Claims under 35 U.S.C. § 102:

The Examiner has Rejected Claims 1-4, 7, 8, 13 and 14 under 35 U.S.C. 102(b) as being anticipated by Shoji *et al.* (US 5,626,985) stating:

> A person shall be entitled to a patent unless —
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Specifically

The Examiner states that:

> Shoji *et al.* disclose a lithium battery (column 1, lines 51-57) with a cathode that includes MnO_2, carbon powder and a fluoropolymer binder, in respective weight percentages of 80, 10 and 10 (column 2, line 64 through column 3, Line 1). Since these are the same materials presently claimed, any recited properties would inherently accrue.

Response

Applicant has Amended both Claim 1 and Claim 14 to limit the range of components 1-3 to a range more narrowly aligned with the example cells described at paragraph [0019]. This range of limitations is significantly different from the range disclosed in Shoji, *et al.* Since this range reflects the range already indicated by the Examiner as being Allowable in Claims 9-11 which Claims are indicated as Objected to as being Dependent upon a Rejected Base Claim; however, would be Allowable if rewritten in Independent Form including all of the limits of the Base Claim and each Intervening

Claim and there are no intervening Claims, Claim 1 as Amended should be Allowable as rewritten as should Claim 14. Should Claim 1 be Allowable Claims 2-8 and 11-13 should also be Allowable (including Claims 5 and 6 which are not indefinite). Note that Claim 6 is the only Claim which Depends indirectly from Claim 1 with Claim 5 being an Intervening Claim.

Rejection of Claims under 35 U.S.C. § 103(a):

The Examiner states that:

> The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
>
> > (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Specifically

The Examiner states that:

> Claims 1-7 and 12-14 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kelley *et al.* (US 6,322,744).
>
> Kelley *et al.* disclose a battery cathode including an active material such as $LiMn_2O_4$, $LiCoO_2$ and $LiNiO_2$ (column 8, lines 19-22); a carbon black conductive additive (column 7, lines 19-24); and a fluoropolymer binder (column 8, lines 31-34). The relative amounts of these components would fall into or overlap the ranges presently recited (column 7, lines 19-24). While the cathode of Kelley *et al.* is for a lithium cell (column 8, line 15), recitations of intended use, such as "for a metal-air battery" do not distinguish. Since the "high-surface area" recited for the carbon black is indefinite in scope (as stated above), the carbon black would meet claims 5 and 6 to the extent that they are understood.

Response

As described above, Applicant has Amended Claims 1 and 14 in a manner that Obviates the Examiner's Rejection and places the Claims into Condition for Allowance since the relative amount of the components no longer fall into or overlap

the range recited. Similarly, each of the Dependent Claims, Claims 2-7 and 12-13 whether Original or Amended being Dependent from Claim 1 are themselves Allowable. Again, Claims 5 and 6, which are not Indefinite; however, which would assumedly have been Rejected under 102(b) or 103(a) as well now Depend from an Allowable Claim: in the case of Claim 5 from Claim 1 and in the case of Claim 6 from Claim 5 , which itself Depends from Claim 1, and should be Allowable.

In addition, as to Claim 14, Applicant Respectfully disagrees with the Examiner's statement that a "statement of intended use," such as "for a metal-air battery" do not distinguish. It is true that the preamble of a claim does not limit the scope of the claim when it merely states a purpose or intended use of the invention. See ***In Re Paulsen,*** 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994) citing *DeGeorge v. Bernier*, 768 F.2d 1318, 1322 n.3, 226 USPQ 758, 761 n.3 (Fed. Cir. 1985). There are situations; however, when terms appearing in a preamble may be deemed limitations of a claim because they "give meaning to the claim and properly define the invention." ***In Re Paulsen*** at 1479 citing *Gerber Garment Technology, Inc. v. Lectra Sys., Inc.*, 916 F.2d 683, 688, 16 USPQ2d 1436, 1441 (Fed. Cir. 1990) (quoting *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 896, 221 USPQ 669, 675 (Fed. Cir.), cert. denied, 469 U.S. 857, 83 L. Ed. 2d 120, 105 S. Ct. 187 (1984)). ***In Re Paulsen*** goes on to state that "although no 'litmus test' exists as to what effect should be accorded to words contained in a preamble, review of a Patent in its entirety should be made to determine whether the Inventors intended such language to represent an additional structural limitation or mere introductory language. Citing *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257, 9 USPQ2d 1962, 1966 (Fed. Cir. 1989); *In re Stencel*, 828 F.2d 751, 754, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987). This is a situation such as ***In Re Paulsen***; whereas in that case the preamble dealt with "a computer," in this case in Claim 14 Applicant is Claiming a cathode material "for a metal-oxygen battery." A metal-oxygen battery is a specific type of battery.

The metal-oxygen battery is distinguished from the Non-Aqueous Electrolyte Secondary Battery (also called a lithium-ion battery) by several factors. The first factor is that the metal-oxygen battery uses a soluble cathode material, *i.e.* O_2 that needs to be transported through the bulk of a carbon black electrode that acts as a current collector for the cathode reaction (cathode reaction: $O_2 + 2e^- \rightarrow O_2^{-2}$). The lithium-ion battery, as well as other lithium primary batteries, already have the cathode material in place with no transport being necessary. The metal-oxygen battery functions properly only when the O_2 can be transported into the cell through the electrolyte in a quick and efficient manner. It is the ability of the electrolyte to transport the O_2 that is of most importance and is what distinguishes a lithium-oxygen battery electrolyte from a lithium-ion battery electrolyte.

The second factor that distinguishes a metal-oxygen battery from a lithium-ion battery is that the discharge product ($2Li^+ + O_2^{-2} \rightarrow Li_2O_2$) is deposited in the cathode as a solid and discharge ends when the carbon black electrode is full of Li_2O_2.

Discharge in a lithium-ion battery ceases when all of the lithium in the anode is shuttled over to the cathode.

A person skilled in the art of batteries would not know from the Kelley, *et al.* work or any other published work how to identify or make a useful and practical cathode specifically for a metal-oxygen battery.

Specifically

The Examiner states that:

> Claims 1-7 and 12-14 have been Rejected under 35 U.S.C. 102(a) and (e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tsushima *et al.* (US 6,558,846).
>
> Tsushima *et al.* disclose a battery cathode including an active material such as $LiMn_2O_4$, $LiCoO_2$ and $LiNiO_2$) [sic]; a carbon black conductive additive; and a PTFE binder (column 5, line 57 through column 6, line 39). The relative amounts of these components would fall into or overlap the ranges presently recited (column 3, lines 23-25 and column 4, lines 11-14). While the cathode of Tsushima *et al.* is for a lithium cell (column 2, lines 8-11), recitations of intended use, such as "for a metal-air battery" do not distinguish. The surface area of the carbon black ranges from 800 to 3,000 m^2/g, thus meeting claims 5 and 6 to the extent that they are understood.

Response

As described above, Applicant has Amended Claims 1 and 14 in a manner that Obviates the Examiner's Rejection and places the Claims into Condition for Allowance since the relative amount of the components no longer fall into or overlap the range recited. Similarly, each of the Dependent Claims, Claims 2-7 and 12-13 whether Original or Amended being Dependent from Claim 1 are themselves Allowable. Again, Claims 5 and 6, which are not Indefinite; however, which would assumedly have been Rejected under 102(b) and (e) or 103(a) as well, now Depend from an Allowable Claim: in the case of Claim 5 from Claim 1 and in the case of Claim 6 from Claim 5, which itself Depends from Claim 1, and should be Allowable.

Again, Applicant Respectfully Disagrees with the Examiner that the preamble "for a metal-air battery" in Claim 14 does not distinguish. For the reasons cited above, the Preamble in this case does distinguish a cathode material for a metal-air battery from that for a lithium battery.

Specifically

The Examiner states that:

> Claims 4 and 8 have been Rejected under 35 U.S.C. 103(a) as being unpatentable over either Kelley *et al.* or Tsuschima [sic] *et al.* each in view of

Tomiyama *et al.* (US 6,053,953).

> Kelley *et al.* or Tsuschima [sic] *et al.* do not disclose MnO_2, CoO_2, NiO_2, MoS_2 or TiS_2 as cathode active materials. Tomiyama *et al.* disclose all of these compounds for use as active cathode materials (column 7, line 64 through column 8, line 5) in lithium cells (column 5, Lines 23-25). For this reason, it would be obvious to use the compounds of Tomiyama, *et al.* as the active materials in the cathodes of either Kelley *et al.* or Tsuschima [sic] *et al.*

Response
As described above, Applicant has Amended Claim 1 in a manner that Obviates the Examiner's Rejection making Claim 1 Allowable which also Obviates the Examiner's Rejection of Claims 4 and 8 which Depend from Claim 1 and places those Claims into Condition for Allowance. While Tomiyama *et al.* may disclose the use of the compounds for active cathode materials, even taken together with Kelley or Tsushima it would not have been obvious to use these components in the relative amounts listed in Claim 1 as Amended.

Allowable Subject Matter

The Examiner has stated

> Claims 9-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art cited either herein or by applicants does not disclose a cathode material including MnO_2, carbon and a fluoropolymer binder in the recited relative amounts. While mixtures of these components are known, the amount of MnO_2 is either smaller, where the cathode is used to reduce oxygen from air, or larger, when the cathode itself provides the active material.

Response
While not requiring a Response, Applicant is grateful to the Examiner for the indication that Claims 9-11 would be Allowable if rewritten in independent Form to include all of the limitations from Base Claim 1 and the respective Claim. Applicant believes that it Amendment to Claim 1 Obviates the need to rewrite Claims 9 and 10 in Independent Form; however, Claim 11 falling outside the limited range of Claim 1 as Amended has been rewritten in Independent Form and should now be in condition for Allowance whether or not Claim 1 is Allowable.

Miscellaneous Amendment

Applicant has Amended Claim 12 to specifically Claim a cathode material wherein the first component is limited to 35-45% of TiS_2. Applicant has Added Claim 15 to specifically Claim a cathode material wherein the first component is limited to 35-45% of MoS_2. Each of these Claims specifically Claims a specific oxide or sulfide of

a metal capable of intercalating lithium consistent with the limitations of Claims 1 and 4.

Conclusion

Applicant has previously paid for Examination of 3 Independent Claims and 20 Total Claims. The Application as originally Filed contained 2 Independent Claims and 14 total Claims. Rewriting Claim 11 into Independent Form brings the total of Independent Claims to 3 and Adding Claim 15 brings the Total Number of Claims to 15, which is within the limits of the number of Claims the Fee for the Examination of which has been already paid.

Applicant believes that the Amendments made above respond to each and every one of the Examiner's Objections and Rejections and are such as to place the Application into Condition for Allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

The Examiner is invited to telephone the undersigned at the local telephone number given below if, after considering this amendment, the Examiner is of the opinion that the Amendments made by Applicant have not resolved all outstanding issues in this case and brought the case into Condition for Allowance.

Respectfully submitted,

17 MAY 2006
DATE

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